



PIGV gene

phosphatidylinositol glycan anchor biosynthesis class V

Normal Function

The *PIGV* gene provides instructions for making an enzyme called GPI mannosyltransferase 2. This enzyme takes part in a series of steps that produce a molecule called a glycosylphosphatidylinositol (GPI) anchor. Specifically, GPI mannosyltransferase 2 adds the second of three molecules of a complex sugar called mannose to the GPI anchor. This step takes place in the endoplasmic reticulum, which is a structure involved in protein processing and transport within cells. The complete GPI anchor attaches (binds) to various proteins in the endoplasmic reticulum. After the anchor and protein are bound, the anchor attaches itself to the outer surface of the cell membrane, ensuring that the protein will be available when it is needed.

Health Conditions Related to Genetic Changes

Mabry syndrome

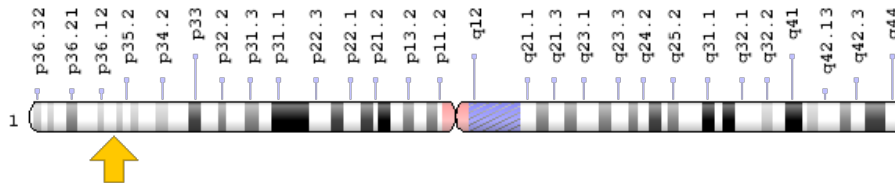
At least 14 mutations in the *PIGV* gene have been found to cause Mabry syndrome, a condition characterized by intellectual disability, distinctive facial features, increased levels of an enzyme called alkaline phosphatase in the blood (hyperphosphatasia), and other signs and symptoms. These mutations change single protein building blocks (amino acids) in the GPI mannosyltransferase 2 enzyme. The altered protein is less able to add mannose to the forming GPI anchor. The incomplete GPI anchor cannot attach to proteins; without the anchor, the proteins cannot bind to the cell membrane and are released from the cell.

An enzyme called alkaline phosphatase is normally attached to a GPI anchor. However, when the anchor is impaired, alkaline phosphatase cannot be anchored to the cell membrane. Instead, alkaline phosphatase is released from the cell. This abnormal release of alkaline phosphatase is responsible for the hyperphosphatasia in Mabry syndrome. It is unclear how *PIGV* gene mutations lead to the other features of Mabry syndrome, but these signs and symptoms are likely due to a lack of proper GPI anchoring of proteins to cell membranes.

Chromosomal Location

Cytogenetic Location: 1p36.11, which is the short (p) arm of chromosome 1 at position 36.11

Molecular Location: base pairs 26,787,963 to 26,798,403 on chromosome 1 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- dol-P-Man dependent GPI mannosyltransferase
- FLJ20477
- GPI mannosyltransferase 2
- GPI mannosyltransferase II
- GPI-MT-II
- HPMRS1
- phosphatidylinositol glycan anchor biosynthesis, class V
- PIG-V
- PIGV_HUMAN

Additional Information & Resources

Educational Resources

- Basic Neurochemistry (sixth edition, 1999): Glycosylphosphatidylinositol-Anchored Proteins (figure)
<https://www.ncbi.nlm.nih.gov/books/NBK28131/box/A206/>
- Essentials of Glycobiology (second edition, 2009): Glycosylphosphatidylinositol Anchors
<https://www.ncbi.nlm.nih.gov/books/NBK1966/>
- Molecular Biology of the Cell (fourth edition, 2002): The Attachment of a GPI Anchor to a Protein in the ER (figure)
<https://www.ncbi.nlm.nih.gov/books/NBK26841/figure/A2241/?report=objectonly>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28PIGV%5BTIAB%5D%29+OR+%28PIG-V%29+OR+%28GPI+mannosyltransferase+2%29+OR+%28GPI+mannosyltransferase+II%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D>

OMIM

- PHOSPHATIDYLINOSITOL GLYCAN ANCHOR BIOSYNTHESIS CLASS V PROTEIN
<http://omim.org/entry/610274>

Research Resources

- ClinVar
<https://www.ncbi.nlm.nih.gov/clinvar?term=PIGV%5Bgene%5D>
- HGNC Gene Family: Dolichyl D-mannosyl phosphate dependent mannosyltransferases
<http://www.genenames.org/cgi-bin/genefamilies/set/430>
- HGNC Gene Family: Phosphatidylinositol glycan anchor biosynthesis
<http://www.genenames.org/cgi-bin/genefamilies/set/680>
- HGNC Gene Symbol Report
http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=26031

- NCBI Gene
<https://www.ncbi.nlm.nih.gov/gene/55650>
- UniProt
<http://www.uniprot.org/uniprot/Q9NUD9>

Sources for This Summary

- Horn D, Krawitz P, Mannhardt A, Korenke GC, Meinecke P. Hyperphosphatasia-mental retardation syndrome due to PIGV mutations: expanded clinical spectrum. *Am J Med Genet A*. 2011 Aug; 155A(8):1917-22. doi: 10.1002/ajmg.a.34102. Epub 2011 Jul 7.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/21739589>
- Krawitz PM, Schweiger MR, Rödelberger C, Marcelis C, Kölsch U, Meisel C, Stephani F, Kinoshita T, Murakami Y, Bauer S, Isau M, Fischer A, Dahl A, Kerick M, Hecht J, Köhler S, Jäger M, Grünhagen J, de Condor BJ, Doelken S, Brunner HG, Meinecke P, Passarge E, Thompson MD, Cole DE, Horn D, Roscioli T, Mundlos S, Robinson PN. Identity-by-descent filtering of exome sequence data identifies PIGV mutations in hyperphosphatasia mental retardation syndrome. *Nat Genet*. 2010 Oct;42(10):827-9. doi: 10.1038/ng.653. Epub 2010 Aug 29.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/20802478>
- Murakami Y, Kanzawa N, Saito K, Krawitz PM, Mundlos S, Robinson PN, Karadimitris A, Maeda Y, Kinoshita T. Mechanism for release of alkaline phosphatase caused by glycosylphosphatidylinositol deficiency in patients with hyperphosphatasia mental retardation syndrome. *J Biol Chem*. 2012 Feb 24;287(9):6318-25. doi: 10.1074/jbc.M111.331090. Epub 2012 Jan 6.
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- OMIM: PHOSPHATIDYLINOSITOL GLYCAN ANCHOR BIOSYNTHESIS CLASS V PROTEIN
<http://omim.org/entry/610274>
- Thompson MD, Roscioli T, Marcelis C, Nezarati MM, Stolte-Dijkstra I, Sharom FJ, Lu P, Phillips JA, Sweeney E, Robinson PN, Krawitz P, Yntema HG, Andrade DM, Brunner HG, Cole DE. Phenotypic variability in hyperphosphatasia with seizures and neurologic deficit (Mabry syndrome). *Am J Med Genet A*. 2012 Mar;158A(3):553-8. doi: 10.1002/ajmg.a.35202. Epub 2012 Feb 7.
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